

DIII-D National Fusion Program

**Presented at
Office of Fusion Energy Science
FY05 Budget Planning Meeting
Washington, DC**

March 18-20, 2003

DIII-D NATIONAL PROGRAM INTRODUCTION

by
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Office of Fusion Energy Sciences
FY05 Budget Planning Meeting
Washington, DC

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THE DIII-D INTERNATIONAL TEAM: THE MOST VALUABLE ASSET OF THE DIII-D PROGRAM



US Labs

ANL (Argonne, IL)
INEL (Idaho Falls, ID)
LANL (Los Alamos, NM)
LLNL (Livermore, CA)
ORNL (Oak Ridge, TN)
PNL (Richland, WA)
PPPL (Princeton, NJ)
SNL (Sandia, NM)

US Industries

CompX (Del Mar, CA)
CPI (Palo Alto, CA)
Creare (Hanover, NH)
Digital Finetec (Ventura, CA)
FAR Tech (San Diego, CA)
HiTech Metallurgical (San Diego, CA)
IR&T (Santa Monica, CA)
Orincon (San Diego, CA)
SAIC (La Jolla, CA)
Surmet (Burlington, MA)
Thermacore (Lancaster, PA)
TSI Research (Solana Beach, CA)

US Universities

Alaska (Fairbanks, AK)
Auburn (Auburn, Alabama)
Cal Tech (Pasadena, CA)
Colorado (Boulder, CO)
Columbia (New York, NY)
Georgia Tech (Atlanta, GA)
Hampton (Hampton, VA)
Lehigh (Bethlehem, PA)
Maryland (College Park, MD)
MIT (Boston, MA)
Palomar (San Marcos, CA)
New York U. (New York, NY)
Texas (Austin, TX)
UCB (Berkeley, CA)
UCI (Irvine, CA)
UCLA (Los Angeles, CA)
UCSD (San Diego, CA)
U. New Mexico (Albuquerque, NM)
Washington (Seattle, WA)
Wisconsin (Madison, WI)

Russia

Ioffe (St. Petersburg, Russia)
Keldysh (Udmurtia, Moscow, Russia)
Kurchatov (Moscow, Russia)
Moscow State (Moscow, Russia)
Trinita (Troitsk, Russia)
Gycom (Nizhny Novgorod, Russia)

European Community

Cadarache (St. Paul-lez, Durance, France)
Consorzio RFX (Padua, Italy)
Culham (Culham, Oxfordshire, England)
Frascati (Frascati, Lazio, Italy)
FOM (Utrecht, The Netherlands)
IPP (Garching, Germany)
JET-EFDA (Oxfordshire, England)
KFA (Julich, Germany)
Lausanne (Lausanne, Switzerland)
Chalmers U. (Goteberg, Sweden)
Helsinki U. (Helsinki, Finland)
U. Naples (Naples, Italy)
U. Strathclyde (Glasgow, Scotland)
U. Wales (Wales)

Japan

JAERI (Naka, Ibaraki-ken, Japan)
JT-60U
JFT-2M
Tsukuba University (Tsukuba, Japan)
NIFS (Tokai, Gifu-ken, Japan)
LHD

Other International

Australia National U. (Canberra, AU)
ASIPP (Hefei, China)
KAIST (Daegon, S. Korea)
KBSI (Daegon, S. Korea)
National U. (Taiwan)
Nat. Nucl. Ctr. (Kurchatov City, Kazakhstan)
SWIP (Chengdu, China)
U. Alberta (Alberta, Canada)
U. Toronto (Toronto, Canada)

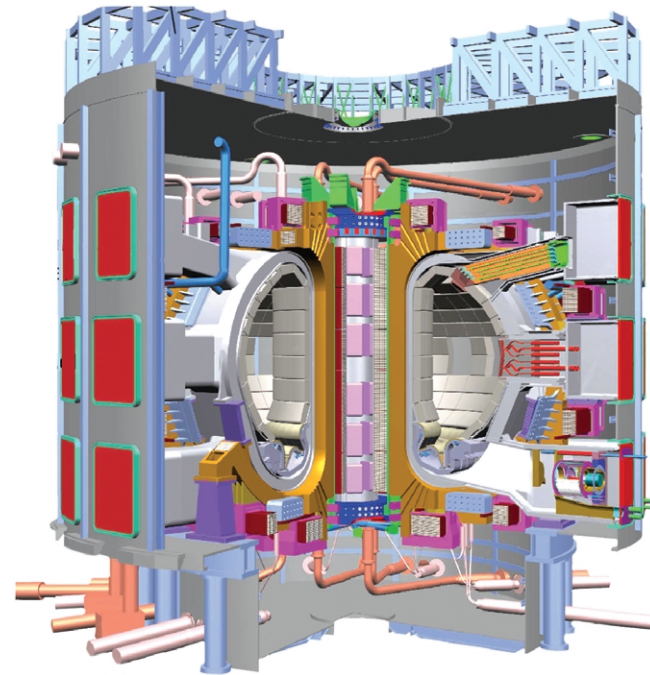
THESE ARE EXCITING TIMES IN FUSION

- **President George W. Bush**

“The results of ITER will advance the effort to produce clean, safe, renewable, and commercially -available fusion energy by the middle of this century. Commercialization of fusion has the potential to dramatically improve America’s energy security while significantly reducing air pollution and emissions of greenhouse gases.”

- **Secretary of Energy, Spencer Abraham**

“By the time our young children reach middle age, fusion may begin to deliver energy independence ... and energy abundance ...to all nations rich and poor. Fusion is a promise for the future we must not ignore. But let me be clear, our decision to join ITER in no way means a lesser role for the fusion programs we undertake here at home. It is imperative that we maintain and enhance our strong domestic research program Critical science needs to be done in the U.S., in parallel with ITER, to strengthen our competitive position in fusion technology.”

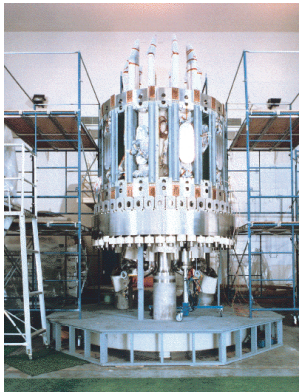


ITER WILL PROVIDE AN ORGANIZING POINT FOR THE WORLD, U.S., AND DIII-D PROGRAMS

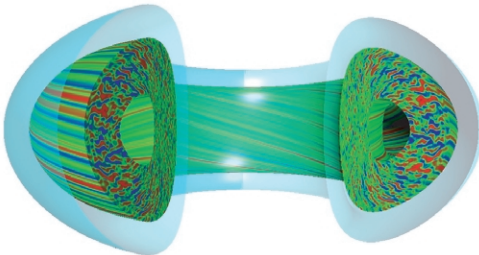
DIII-D Program



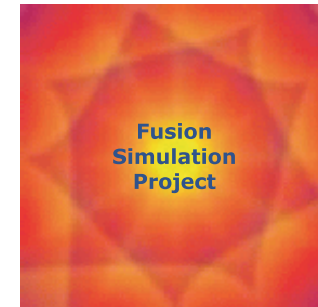
Alcator C-Mod



Theory Program



ISOFS



Collaboratory



WE HAVE THE OPPORTUNITY IN THIS DECADE TO MAKE THREE MAJOR ADVANCES

1. Advanced Tokamak physics basis for steady-state operation of ITER, CTF, and DEMO
 - The building blocks of AT physics are in place or close-at-hand
 - Wall stabilization looks like it will work
 - Neoclassical tearing mode stabilization with ECCD works
 - Successful disruption mitigation technique is available
 - Current profile control demonstrations have started (ECCD physics)
 - Enhanced confinement states are numerous
 - ELM free regimes exist (C-mod and DIII-D)
 - Necessary density control methods have been shown
 - New era of plasma control is starting
 - The path to AT performance appears open on all fronts. Integration is key
2. An understanding of the basic mechanisms of transport from turbulence
 - Our last remaining science area to achieve predictive code capability
 - Improved computational capabilities and diagnostics needed
3. The science and technology basis for operation of ITER and DEMO with carbon PFCs
 - DIII-D provides the science of erosion/redep and material flows in the boundary
 - Technology Program provides laboratory studies of extraction of hydrogenic species from co-deposited carbon films

NOW IS THE TIME TO SIEZE THESE OPPORTUNITIES

